[0213] An alternative apparatus for opening a vessel is indicated by reference number **160** in FIG. **13**A. As shown in FIG. **13**A, a fluid vessel (or blister) **162** is mounted on a substrate **172** and is connected by means of a channel—which may or may not be initially blocked by a breakable seal—to a dimple **161**. A film layer **164** may be disposed on the bottom of the substrate **172** to cover one or more channels formed in the bottom of the substrate **172** to form fluid conduits. An opening device comprising a cantilevered lance **166** is positioned within a lance chamber **170** formed in the substrate **172** where it is anchored at an end thereof by a screw attachment **168**.

[0214] A foil partition or septum **165** seals the interior of the dimple **161** from the lance chamber **170**. An actuator pushes the lance **170** up in the direction "A" into the dimple **161**, thereby piercing the foil partition **165** and permitting fluid to flow from the blister **162** out of the lance chamber **170** and a fluid exit port. The spring force resilience of the lance **166** returns it to its initial position after the upward force is removed. In one embodiment, the lance **166** is made of metal. Alternatively, a plastic lance could be part of a molded plastic substrate on which the blister **162** is formed. Alternatively, a metallic lance could be heat staked onto a male plastic post. A further option is to employ a formed metal wire as a lance.

[0215] A further alternative embodiment of an apparatus for opening a vessel is indicated by reference number **180** in FIG. **14**. A component having one or more deformable vessels includes at least one blister **182** formed on a substrate **194**. In the arrangement shown in FIG. **14**, an internal dimple **184** is formed inside the blister **182**. Internal dimple **184** encloses an opening device comprising a fixed spike **186** projecting upwardly from a spike cavity **188** formed in the substrate **194**. A film layer **192** is disposed on an opposite side of the substrate **194**. As an actuator presses down on the blister **182**, internal pressure within the blister **182** causes the internal dimple **184** to collapse and invert. The inverted dimple is punctured by the fixed spike **186**, thereby permitting fluid within the blister **182** to flow through an exit port **190**.

[0216] An alternative apparatus for opening a vessel is indicated by reference number **200** in FIG. **15**A. As shown in FIG. **15**A, a fluid vessel (or blister) **202** is mounted on a substrate **216** and is connected by means of a channel—which may or may not be initially blocked by a breakable seal—to a dimple **204**. An opening device comprising a lancing pin **206** having a fluid port **208** formed through the center thereof (see FIG. **15**B) is disposed within a segmented bore **220** formed in the substrate **216** beneath the dimple **204**. A partition or septum **205** separates the dimple **204** from the bore **246**, thereby preventing fluid from exiting the blister **202** and dimple **204**. An actuator (not shown) presses on a film layer **212** disposed on a bottom portion of the substrate **216** in the direction "A" forcing the lancing pin **206** up within the segmented bore **220** until a shoulder **210** formed on the lancing pin **206** encounters a hard stop **222** formed in the segmented bore **246**. A lancing point of the pin **206** pierces the partition **205** thereby permitting fluid to flow through the fluid port **214** in the lancing pin **206** and out of a fluid exit channel **214**.

[0217] An alternative embodiment of an apparatus for opening a vessel is indicated by reference number **230** in FIGS. **16**A and **16**B. As shown in FIG. **16**A, a fluid vessel (or blister) **232** is mounted on a substrate **244** and is connected by means of a channel—which may or may not be initially blocked by a breakable seal—to a dimple **234**. An opening device comprising a lancing pin **236** is disposed within a segmented board **246** formed in the substrate **244** beneath the dimple **234**. A partition or septum **235** separates the dimple **234** from the segmented bore **246**. The upper surface of the substrate **244** is sealed with a film **240** before the blister **232** and dimple **234** are adhered. An actuator (not shown) pushes up on the lancing pin **236** in the direction "A" until a shoulder **238** formed on the lancing pin **236** encounters hard stop **248** within the bore **246**. The pin **236** thereby pierces the partition **235** and remains in the upper position as fluid flows out along an exit channel **242** formed on an upper surface of the substrate **244**. A fluid tight seal is maintained between the pin **238** and the bore **246** by a slight interference fit.

[0218] As the collapsible fluid vessels of a liquid reagent module are configured to be compressed and collapsed to displace the fluid contents from the vessel(s), such vessels are susceptible to damage or fluid leakage due to inadvertent exposures to contacts that impart a compressing force to the vessel. Accordingly, when storing, handling, or transporting a component having one or more collapsible fluid vessels, it is desirable to protect the fluid vessel and avoid such inadvertent contact. The liquid reagent module could be stored within a rigid casing to protect the collapsible vessel(s) from unintended external forces, but such a casing would inhibit or prevent collapsing of the vessel by application of an external force. Thus, the liquid reagent module would have to be removed from the casing prior to use, thereby leaving the collapsible vessel(s) of the module vulnerable to unintended external forces.

[0219] An apparatus for protecting and interfacing with a collapsible vessel is indicated by reference number **260** in FIGS. **17**, **18**, and **19**. A component with one or more collapsible vessels includes a collapsible blister **262** formed on a substrate **264**. A dispensing channel **266** extends from the blister **262** to a frangible seal **268**. It is understood that, in some alternative embodiments, the dispensing channel **266** may be substituted with a breakable seal, providing an additional safeguard against an accidental reagent release.

[0220] Frangible seal **268** may comprise one of the apparatuses for opening a vessel described above and shown in any of FIGS. **8**-**16**.

[0221] A rigid or semi-rigid housing is provided over the blister **262** and, optionally, the dispensing channel **266** as well, and comprises a blister housing cover **270** covering the blister **262** and a blister housing extension **280** covering and protecting the dispensing channel **266** and the area of the frangible seal **268**.

[0222] A floating actuator plate **276** is disposed within the blister housing cover **270**. In the illustrated embodiments, both the blister housing cover **270** and the floating actuator plate **276** are circular, but the housing **270** and the actuator plate **276** could be of any shape, preferably generally conforming to the shape of the blister **262**.

[0223] The apparatus **260** further includes a plunger **274** having a plunger point **275** at one end thereof. Plunger **274** is disposed above the blister housing cover **270** generally at a center portion thereof and disposed above an aperture **272** formed in the housing **270**.

[0224] The floating actuator plate **276** includes a plunger receiver recess **278**, which, in an embodiment, generally conforms to the shape of the plunger point **275**.

[0225] The blister **262** is collapsed by actuating the plunger **274** downwardly into the aperture **272**. Plunger **274** may be actuated by any suitable mechanism, including one of the actuator mechanisms **50**, **80** described above. Plunger **274** passes into the aperture **272** where the plunger point **275** nests